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SOLUTION.

The distance of the centre of gravity of the bowl from the centre of the rim is

$$\frac{\pi (R^4 - r^4)}{4M},$$

where M is the volume of the bowl.

Let α be the angle of inclination of the bowl to the horizon, and take moments about the point of support, the vertical through which passes through the centre of the rim, the line of action of the upward pressure being normal to the surface.

We get

$$\tan \alpha = \frac{16Ra^3}{3(R^4 - r^4)}.$$

[*Geo. R. Dean.*]

EXERCISES.

366

SHOW that for any parabola $y = x^2 + ax + b$, the area included between the curve, any two ordinates, and the x-axis, is equal to the product of the ordinate midway between the bounding ordinates and the interval between them, plus one-twelfth the cube of this interval. [*W. H. Echols.*]

367

ON the axis of x take any point x_m, and equi-distant from it on either side select points a and b. Draw verticals through a and b, also the circle on ab as diameter. With a and b as centers and radius equal to a side of the inscribed square draw arcs cutting the verticals at a and b in a' and b'. The straight lines $a'x_m$ and $b'x_m$ cut the circle in points whose abscissæ are x_1 and x_2, respectively.

Show that if any cubic* of the form

$$y = x^3 + \alpha x^2 + \beta x + \gamma$$

be described passing through any two points x_1y_1 and x_2y_2 on the verticals at a and b respectively, then the area included between the curve, the verticals at a and b, and the x-axis, is constant and equal to

$$\tfrac{1}{2}(y_1 + y_2)(b - a).$$

[*W. H. Echols.*]

368

A HOMOGENEOUS ellipsoid of weight W and semi-axes a, b, c has a weight P suspended from a point on the surface whose coordinates, referred to the axial planes, are l, m, n. Find the inclinations of the axial planes to the horizontal plane upon which the ellipsoid rests. [*H. Y. Benedict.*]

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* Of course the same applies to any curve of lower degree, as the parabola

$$y = x^2 + px + q.$$